



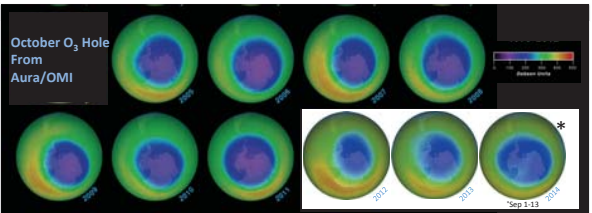
Highlights from a Decade of OMI-TOMS Total O₃

D. P. Haffner¹, P. K. Bhartia², R. D. McPeters², J. Joiner², J. R. Ziemke³,
¹Science Systems and Applications, Inc., ²NASA Goddard Space Flight Center

Abstract

Total ozone measurements from OMI have been instrumental in meeting Aura science objectives. In the last decade, OMI has extended the length of the TOMS total ozone record to over 35 years to monitor stratospheric ozone recovery. OMI-TOMS total ozone measurements have also been combined synergistically with measurements from other Aura instruments and MLS in particular, which provides vertically resolved information that complements the total O₃ mapping capability of OMI. With this combined approach, the EOS Aura platform has produced more accurate and detailed measurements of tropospheric ozone. This has led in turn to greater understanding of the sources and transport of tropospheric ozone as well as its radiative forcing effect. The combined use of OMI and MLS data was also vital to the analysis of the severe Arctic ozone depletion event of 2011. The quality of OMI-TOMS total O₃ data used in these studies is the result of several factors: a mature and well-validated algorithm, the striking stability of the OMI instrument, and OMI's hyperspectral capabilities used to derive cloud pressures. The latter has changed how we think about the effects of clouds on total ozone retrievals. We will discuss the evolution of the operational V8.5 algorithm and provide an overview and motivation for V9. After reviewing results and developments of the past decade, we finally highlight how ozone observations from EOS Aura are playing an important role in new ozone mapping missions.

Is the Stratospheric Ozone Layer Recovering? (in maps?)



2005-2014

Hard to impossible to tell from these figures, but they communicate an important story.

OMI is a mapping instrument, and while extension of the total O₃ record is a main goal of OMI, for NASA the recommended total O₃ column long-term dataset is SBUV total O₃. But OMI-TOMS data quality is very good as well. The figure to the right compares OMI-TOMS and SBUV(2) total ozone data.

"...in a rare piece of good news about the health of the planet." – AP

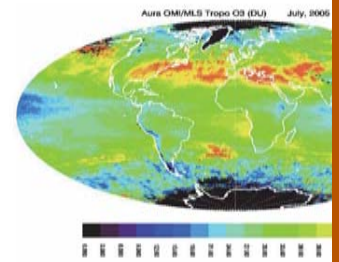
Assessment for Decision-Makers
Scientific Assessment of Ozone Depletion: 2014

Fragile ozone layer shows first sign of recovery - U.N.
Source: Reuters - Wirel, 10 Sep 2014 19:44 GMT

April 1, 2014

"There are indications of an increase in global-mean total column ozone over 2000-2012, consistent with model predictions."

Tropospheric O₃ Application



Tropospheric column ozone is determined by subtracting measurements of MLS stratospheric ozone (SCO) from OMI total column ozone. For intercalibration differences of the two instruments using the convective-cloud differential (CCD).

CLOUD SLICING MEASUREMENTS OF OZONE INSIDE THICK CLOUDS

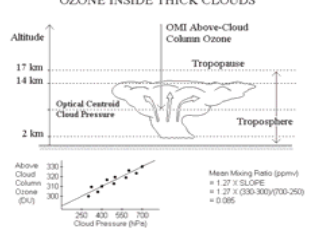


Fig. 4. Schematic diagram illustrating the ensemble cloud-slicing method. The figure shows that a satellite UV instrument is sensitive to the O₃ column from the top of the atmosphere down to the OCCP altitude which may lie several hundred hPa below geometrical cloud top. The lower half of the figure illustrates that using an ensemble of such measurements over a fixed region, mean volume mixing ratio can be determined from the slope of column O₃ plotted versus OCCP.

Fig. 7. Time series of TCO (in DU) at 15°S latitudes 1979-2009 (see text). The data were filtered by the 3-month running average was vertical axis refer to January of the particular year.

Observations on EOS Aura

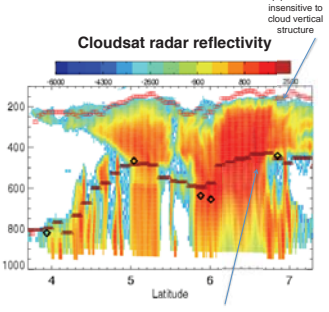
Vasilkov¹, G. J. Labow¹, E. W. Chiou⁴,
at a State Univ., ⁴ADNET Systems, Inc.



Synergy: OMI + MLS

The synergy of OMI and MLS measurements has been particularly advantageous to the study of both tropospheric and stratospheric ozone processes. Differential sensitivity among these two instruments on the same platform have made Aura an excellent orbiting O₃ laboratory.

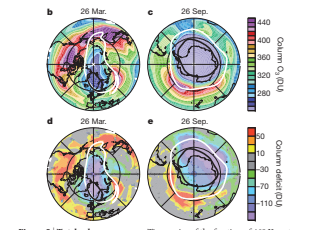
Clouds pressures used in OMI-TOMS



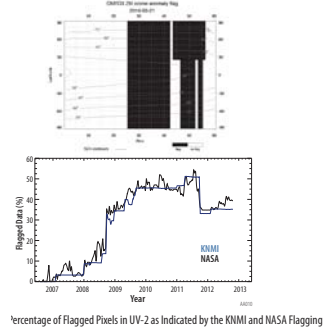
The optical centroid pressure of the scattering cloud layer is much higher than IR pressures assumed early versions of OMI-TOMS. OMI Raman cloud pressures were adopted in V8.5 of the OMI-TOMS algorithm, improving tropospheric O₃ results from cloud differential methods.

Arctic Depletion in 2011

The mechanism responsible for the unprecedented depletion of Arctic ozone was elucidated with the help of OMI-TOMS total ozone data, which was used to establish the magnitude of the ozone deficit. This information was used in CTM runs to help constrain possible scenarios responsible for the large depletion.



OMI TOMS data quality



View metadata, citation and similar papers at core.ac.uk

brought to you by CORE provided by NASA Technical Reports Server